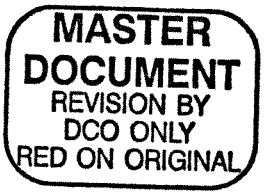
SWALES
AEROSPACE

CONTRACT NO.: N00173-00-C-6011

TASK NO.: 00006.036

Process Specification for the Wrapping and End Capping of the CDE Assembly



SAI-PROC-1234

SEPTEMBER 30, 2003

Revision -

PREPARED BY:

SWALES AEROSPACE

5050 POWDER MILL RD.

BELTSVILLE, MD

SIGNATURE PAGE

This is a controlled document. Any changes require the approval of the Configuration Control Board.

Prepared by:

John I. Haggerty, SAI — Date: 10/1/03

Reviewed by:

Dr. J. Eric Grove, NRL — Date: 9/30/03

Quality Assurance:

Brian Martini, SAI — Date: 9/30/03

Project Manager:

Michael Kennedy, SAI — Date: 10/1/03

DOCUMENT CHANGE RECORD

REVISION	DESCRIPTION	DATE	APPROVAL
–	Initial Release	9/30/03	MM

1. SCOPE

This specification establishes the process and requirements for wrapping and end capping the CDE assembly.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. If no revision is indicated, the latest issue in effect is applicable.

2.1 Government Documents

NAVAL RESEARCH LABORATORY DRAWINGS OR DOCUMENTS

LAT-DS-01900	Crystal Detector Element
LAT-DS-02159	VM2000 Blank Drawing

2.2 Non-Government Documents

SWALES AEROSPACE DRAWINGS OR DOCUMENTS

SAI-PROC-1231	Process Specification for the Handling of CsI Crystals
SAI-PROC-1232	Process Specification for the Handling of Photodiode Assemblies
SAI-PROC-1233	Process Specification for the ESD Handling of CDE Parts and the Assembly

3. REQUIREMENTS

3.1 Appearance

The wrapper shall lap over itself on the top face of the crystal, and the overlapped portion of the wrapper shall not be skewed out of alignment by more than 0.7 mm at either end.

So that the wrapper does not interfere with the placement of the machined end cap, neither end of the wrapper shall extend past the end of the crystal.

The wrapper seam on the top face of the crystal shall be covered with a 312 mm (+0 mm, -1 mm) strip of 12.7 mm wide Kapton tape. The tape length is chosen so that it does not extend beneath the flange of either end cap, but its ends are covered by end-cap mounting tape.

The wrapper shall be tight after both ends caps are taped in place.

The end-cap mounting tape shall not extend onto the chamfers of the end cap. This tape shall cover only the lip of the end cap.

Both end caps shall be firmly seated onto the crystal end faces such that they do not move when modest finger pressure is applied axially to a corner of the end cap.

There shall be no voids under the Kapton tape. There shall be no evidence of the corners of the Kapton tape peeling up.

Minor scratches on the outside surfaces will not affect the reflective properties of the material. If any significant scratches are evident on the sheet of VM2000 that is to be used for this procedure, verify that the material is still acceptable optically before continuing to use the film (a reflection of red light will indicate that the reflective layers have been scratched.)

3.2 Facilities

Except for the location where the VM2000 is cut to size, all operations herein shall be performed in a class 100,000 or better clean room with temperature control between 68°F to 86°F (20°C to 30°C) and humidity control between 30% RH and 50%RH.

The VM2000 shall be unpackaged, cut to size and repackaged at the Gerber cutter location. Special handling is required to maintain cleanliness while in the Gerber cutter location and is addressed herein.

3.3 Handling/Personnel

All personnel handling the CsI Crystals shall be trained and certified to SAI-PROC-1231, Process Specification for the Handling of CsI crystals.

All personnel handing the Photodiode Assemblies shall be trained and certified to SAI-PROC-1232, Process Specification for the Handling of PDAs (Photodiode Assemblies).

All personnel handing parts within this specification shall be trained and certified to SAI-PROC-1233, Process Specification for the ESD Handling of CDE Parts and the Assembly.

All personnel working to this document shall be trained and certified to this document.

Handle the wrapping film and formed wrappers with powder-free nitrile gloves at all times.

3.4 General

Solvent may not come in contact with the wrapping film. Never wipe the film or formed wrapper with solvent.

Handle the wrapping film, formed wrappers and any part of the CDE with powder-free nitrile gloves at all times.

The wrapping film is soft. The slightest abrasion, even by soft objects, may scratch the reflective surface of the film.

All non-flight items being used in the cleaning or bonding of tooling shall be wiped clean by the use of Ethyl alcohol soaked clean room certified wipers.

3.5 Materials

The materials shall be in accordance with the following list:

Material
Ethyl Alcohol, 100% (200 proof)
Gloves, Nitrile, powder-free and static dissipative, "Ansell Brand TNT® Blue"
Wipes, Texwipe TX1004
Swabs, Texwipe, TX-761

3.6 Tooling

C0535	Assembly, Wrap Mold Fixture
C0553	End Cap Taping Fixture

4. PROCESS

4.1 Wrapping

NOTE: One side of the VM2000 film is more reflective than the other. The more reflective side is towards the inside of the roll as received. After the film is cut into pieces, it will have a "curl" across the width. The concave side of the "curl" is the more reflective side.

4.1.1 Wrapper Cutting

1. The wrapper flat stock shall be cut to size using the Gerber cutting machine. Solvent wipe clean the table of the machine with Ethyl alcohol and clean room wipes. Allow the solvent to evaporate 5 minutes minimum.
2. Cover the table of the machine with a 60-inch wide layer of porous Teflon coated fiberglass cloth.
3. Remove the roll of VM2000 from the box and bag. From a new roll, discard the first ten feet of material. From a used roll, discard one full revolution of material. Discard the last ten feet of material on the roll.
4. The material towards the inside of the roll (the more reflective side) shall be up during cutting. Unroll the wrapping film over the porous Teflon coated fiberglass cloth. Verify that there are no wrinkles. Visually check the material for any unusual areas.
5. Cut the film into pieces 100 mm ± 0.5 mm wide x 324.2 mm ± 0.5 mm long, reference drawing LAT-DS-02159. The pieces shall come from at least 4 inches from the edges of the roll (to stay away from edge effects). The Gerber program is designed to cut 66 pieces per machine set-up. The program is also designed to avoid the seams in the Gerber table.
6. While removing the cut pieces from the Gerber, visually check both sides for any unusual condition. If something is noticed on a piece(s), identify the piece(s) with the roll number using a Sharpie and forward to engineering. All pieces within 12 inches of an unusual condition shall be considered suspect and be packaged along with the unusual piece(s).
7. Bag the pieces of film in a clean polyethylene bag. Identify the bag with the work order number. Reserve one piece of film, from each work order number, for future testing.

4.1.2 Wrapper Forming

1. Reference drawing C0535 for tool assembly detail.
2. Clean all working areas free of debris and dust particles before beginning any work so that the hardware and reflective material is not contaminated.
3. Clean all wrapper forming tooling using clean-room wipes and 100% ethyl alcohol. Allow parts to air dry, 5 minutes minimum.
4. Do not use any solvent to clean the wrapping material. Dry-wipe clean both sides of the pre-cut film using a clean-room wipe to remove any dust or lint.
5. The more reflective side will have a blue hue when the film is curled into a funnel shape and a light source is shinning down its length. The less reflective side will have a yellow hue when the film is curled into the same funnel shape and a light source shinning down its length.
6. Assemble the pre-cut wrap into the tooling as follows:

    a. Slip the alignment bar into the bottom fixture and fasten in place.

b. One surface of the wrapper film is more reflective than the other. The more reflective surface (blue hue) shall be against the crystal. The cut flat stock has a slight curl. The curl shall wrap the same direction as to be around the aluminum crystal bar (curl favors the wrapping of the bar). Lay (center) the pre-cut strip of film over the bottom fixture and place and the aluminum crystal bar over the film.

c. Lightly fasten the aluminum crystal bar to the bottom fixture. Align the film by butting the film against the alignment bar. Tighten the 2 screws that fasten the aluminum crystal bar to the bottom fixture.

d. Remove the alignment bar.

e. While guiding the film so that the shorter leg overlaps the longer leg, close out the mold with its top so that the film folds neatly over the aluminum bar.

f. Tighten the 2 mold halves together using the 4-40 screws and washers, 10 places.

7. Visually verify the assembly at both ends of the mold to ensure that the film is not lying improperly in the mold.
8. Place the completed assembly in an oven at 120°C ± 5°C for 120 to 150 minutes.
9. Remove the mold assembly from the oven and allow the mold to cool to before opening the mold.
10. Loosen the close out hardware, 10 places, and remove the mold top.
11. Remove the two mounting screws at each end of the aluminum crystal bar and remove the aluminum crystal bar from the mold.
12. Carefully open the preformed film and remove it from the aluminum crystal bar. The reflective film should now be formed.
13. Verify that the overlapped portion of the wrapper is not skewed out of alignment by more than .027" (0.7 mm). Store the molded wraps until the bonded CDE is ready to be wrapped.

4.1.3 Wrapping of CsI Crystal (CDE)

1. Reference drawing C0544 for tool assembly detail. Reference drawing LAT-DS-01900 for tape locations and tolerances.
2. Loosen the 6 thumbscrews that fasten the hold downs to the base and clamp. Loosen the knob that tightens the clamp.
3. Obtain a crystal assembly ready for wrapping and a preformed wrapper. Slip the wrapper over the crystal with the shorter leg over the longer leg. The overlap shall be on the top ("V" face).
4. Transfer the identification of the crystal from the handling wrap to the flight wrap as follows:

a) On the top surface of the wrapper, identify the wrapper using an ultra fine tipped black Sharpie. The identification shall be crystal serial number followed by a (+). To avoid making an imprint in the crystal, insert a shim between the wrapper and the crystal before writing the identification. Remove the shim after writing.

b) The location of the identification and orientation shall be such that the serial number reads from left to right, with the right edge of the orientation mark within 1 inch (25 mm) of the fiducial "V" on the crystal, and so that it is completely covered by the seam-sealing Kapton tape.

c) The fiducial "V" identifies the "top" surface and the "plus" end (which is the "right" end) of the crystal.

d) The height of the identification shall be no larger than ¼" tall (small enough to fit under the ½" wide Kapton tape).

5. Slide the assembly into the tool until it touches the stop.
6. Lightly tighten the center knob. The knob should be loose enough to allow the wrapper to be pulled up the sides when the hold-downs are pinched in.
7. Lightly tighten the 6 thumbscrews that fasten the hold downs to the base and clamp. They need to be loose enough to allow the hold-downs to be pinched in.
8. Slide the hold-downs in pulling the slack out of the wrapper.
9. Tighten the 6 thumbscrews leaving enough space to allow for the ½" wide Kapton tape.
10. Verify that there are no wrinkles or bulk before taping. If the wrapper doesn't visually look tight, loosen the hold-downs and re-tighten as necessary. Dry wipe the area to be taped to remove anything that might be trapped under the tape.
11. Secure the reflective film in place along the entire length with Kapton tape, ½" wide by 0.0025" thick. Dry wipe the tape with a clean room wipe to distribute pressure at the seam.
12. Release the wrapped CDE from the wrapping fixture.
13. Using an exacto knife as an edge, tear the tape .240" (6.1 mm) from each end of the film.

4.2 Taping End Caps to the Ends, Over the Film

1. Reference drawing C0553 for tool assembly detail. Reference drawing LAT-DS-01900 for tape locations and tolerances.
2. Clean end caps with ethanol moistened clean-room swabs and allow to air dry for a minimum of 5 minutes.
3. Align the wrap so that it is centered along the length of the crystal.
4. The end cap shall be over the wrap. Slip end caps over each end of the assembly, by towing the over lapped film side under the cap first and pivoting the end cap over the wrap. The cap shall be flush against the crystal face.
5. Place the assembly within the taping fixture.
6. The tape used to hold the end cap in place is .375" wide. The length of the tape is .866" (22mm) for the longer sides and .630" (16 mm) long for the shorter sides.
7. Apply tape in a manner that does not capture air between the tape, end cap and wrapper. The tape length shall be located .160" (4 mm) from the outboard edge of the end cap (the tape shall not overlap the "whiter (thicker)" section of the end cap). Rotate the assembly within the fixture to tape all sides. Burnish the tape onto the wrapper and end cap to ensure good adhesion.
8. Verify that the end cap is against the crystal, if it is not, remove the tape and re-tape.

5. POST PROCESS INSPECTION

5.1 Appearance

The CDE identification shall be fully visible and legible. The crystal and PDA serial numbers shall be consistent with those indicated in the bonding traveler.

The wrapper shall be tight after both end caps are taped in place.

The end-cap mounting tape shall not extend onto the chamfers of the end cap. This tape shall cover only the lip of the end cap.

Both end caps shall be firmly seated onto the crystal end faces such that they do not move when modest finger pressure is applied axially to a corner of the end cap.

Minor scratches on the outside surfaces will not affect the reflective properties of the material. If any significant scratches are evident on the sheet of VM2000 that is to be used for this procedure, verify that the material is still acceptable optically before continuing to use the film (a reflection of red light will indicate that the reflective layers have been scratched.)

6. QUALITY ASSURANCE PROVISIONS

6.1 Material Control

All materials used shall have been received, inspected and issued a Lot Control Number.

6.2 Personnel Certification

Trained and competent technicians as determined shall perform processing in accordance with this specification. All personnel in contact with hardware shall be trained for ESD and clean room procedures.

6.3 Facility Approval Inspection

Facility approval inspection is performed on sample units produced with equipment and procedures normally used in production. Facility approval inspection consists of all the examinations and tests in this specification.

6.4 Quality Conformance Inspection

Quality conformance inspection consists of all the tests and examinations performed on items, which have been submitted for acceptance and specified herein. All parts shall be inspected 100 percent for all requirements except hardness.

7. TESTS

7.1 Surveillance

The cognizant Quality Assurance activity shall provide the surveillance necessary to verify conformance to this specification and processes.

7.2 Equipment Calibration

The cognizant Quality Assurance activity shall assure that the calibration system is in accordance with MIL-STD-45662.